

~~CONFIDENTIAL~~

[REDACTED]

- 2 -

MONTHLY PROGRESS REPORT OF THE CHEMISTRY AND METALLURGY DIVISION

June 1, 1945

The processing of plutonium as received from W is going smoothly. In spite of wide variations in the product as received both in regard to impurities (such as silicon, phosphorus, tin, iron, chromium, nickel, platinum) and oxidation state (present material is about 50% plutonyl nitrate), the wet purification is working well and giving an excellent product, with yields usually only a few percent below the expected 95 to 98%. The reduction of the fluoride continues good, with yields of 98 to 99% depending on the quality of the fluoride supplied. In dry chemistry, a new oxalate ignition cycle and HF procedure has greatly reduced the treatment time required and improved the fluoride produced.

Four attempts to fabricate pure plutonium into 2" diameter hemispheres (630 g) met with failure. The large volume change on transformation from gamma or beta to alpha on cooling after hot pressing invariably resulted in cracks and warping of the diametrical plane. This difficulty was not encountered in 2" diameter 600 g cylindrical discs, and could probably be overcome in hemispheres by directional transformation. Because of the greater efficiency expected from a low density Christy gadget, the decision was made to concentrate on delta plutonium -- which also promises to be free from fabrication trouble associated with volume change after pressing. The alloy of plutonium with 3% gallium after suitable homogenizing treatment is readily retained as delta phase at room temperature, is quite malleable either at room temperature or at temperatures up to 400°C and has proven to be quite stable under any reasonable conditions of treatment.

Our losses of plutonium as determined by inventory are now running about 1% of the amount processed. While this is a considerable improvement over earlier

[REDACTED]

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

- 3 -

work, we still hope for a reduction in losses by an order of magnitude. The study of losses is greatly complicated by the fact that our assay methods have uncertainties of 0.2 to 2%, so that actually the 1% loss may very well not be real. We now believe almost 0.5% (or half the apparent loss ) may be attributed to changes in concentration of samples prior to analysis due to the decomposition of water by the 49 alpha-particles. This error will be kept to a minimum in the future.

Group CM-11 completed the fabrication of 38 kg of 25 into the form of cubes for experiments at Omega. The processes for casting and machining gun target and projectile rings and for the bolt have been completely developed and as soon as the cube material has been reconverted, fabrication of final projectile rings will start.

DC  
b(3)

This work will be found in the report of CM-6, along with studies on electroplated protective coatings, which are by no means unpromising. Many advances are being made in our knowledge of polonium, an element in some

~~CONFIDENTIAL~~

- 4 -

respects newer than plutonium. In this regard the report of group CM-15, particularly jobs 5 and 12, will be found very interesting.

From the report of group CM-14 it will be noted that RaLa separation difficulties mentioned last month have been solved by a modification of the chemical process and by mechanical improvements. Yields of 85% are now consistently achieved at 500 curie level.

J. W. Kennedy

C. S. Smith

R. W. Dodson

~~CONFIDENTIAL~~